School of Ocean & Earth Sciences & Technology
University of Hawai‘i at Mānoa
External Academic Review 2019

Review Committee:
David Bercovici, Committee Chair (Yale University)
Dale Durran (University of Washington)
Stéphan Grilli (University of Rhode Island)
Dennis Hedgecock (University of Southern California)
Margaret Tivey (Woods Hole Oceanographic Institution)

Review Dates: February 20-22, 2019
Review schedule summary

The 2019 academic review for the School of Ocean and Earth Sciences and Technology (SOEST) took place over three days, Feb 20-22, 2019. The review committee consisted of five external members who represented expertise in the SOEST units or departments that maintain undergraduate and/or graduate programs. The committee members, their positions and affiliations were (in alphabetic order):

- David Bercovici (committee chair), Professor and Chair, Department of Geology & Geophysics, Yale University;
- Dale Durran: Professor and Chair, Department of Atmospheric Sciences, University of Washington;
- Stéphan Grilli, Professor and Chair, Department of Ocean Engineering, Professor, Graduate School of Oceanography, University of Rhode Island;
- Dennis Hedgecock, Interim Divisional Dean for Natural Sciences and Mathematics, Professor in Fisheries Ecology and Biological Sciences, University of Southern California;
- Margaret (Meg) Tivey, Vice President for Academic Programs and Dean, Woods Hole Oceanographic Institution.

The review itself was carried out during the first two days (Feb 20-21), while the third day (Feb 22) was dedicated to summarizing the committee findings for a presentation to the university and the school. For the sake of reference, the review schedule is summarized below:

**Day 1 (Feb 20):** The review team members first met together with University President David Lassner and Vice Chancellor for Academic Affairs and for Research Michael Bruno, after which the team met SOEST Dean Brian Taylor and Associate Dean Charles Fletcher. The team members then convened separately with academic units (chairs, undergraduates, graduate students, faculty) for the remainder of the day. The departments and the reviewers with whom they met are as follows:

- Department of Atmospheric Sciences (ATMO) - Dale Durran
- Department of Earth Sciences (EARTH) - David Bercovici
- Marine Biology Graduate Program (MBGP) - Dennis Hedgecock
- Department of Oceanography (OCN) - Meg Tivey
- Department of Ocean Resources and Engineering (ORE) - Stéphan Grilli

**Day 2 (Feb 21):** In the morning the review team members met separately with the following units (reviewers indicated):

- Graduate division (Tivey)
- Associate Vice Chancellor Ron Cambra regarding General Education (Bercovici)
- Mānoa Course Assessment (Duran)
- SOEST Post doctoral researchers (Grilli, Hedgecock)

For the remainder of the day the team met as a group with SOEST participants for the following issues:

- SOEST Undergraduate Advising
- Women in SOEST
- Geopaths initiative
- GES program
- ORU’s regarding student engagement
- Summer programs
- Sea Grant and Space Grant

**SOEST-wide programs and issues**

**Impact of SOEST, locally and internationally**

The School of Ocean and Earth Sciences and Technology (SOEST) was established approximately 30 years ago under a state and university mandate to establish a center of excellence that takes advantage of Hawai‘i’s unique location. The new school brought together various academic units (listed previously) and research institutes in the natural sciences and resource engineering under the purview of one school. The first Dean of SOEST was C. Barry Raleigh who had formerly been the Director of the Lamont Doherty Earth Observatory at Columbia University.

The experiment to create SOEST was a prescient decision by its creators and for all intents and purposes it has been a remarkable success. At its inception SOEST became one of the outstanding gems of the University of Hawai‘i and it has continued to fulfill its promise since. Today the School is one of the country’s (and world’s) pre-eminent earth, atmosphere and oceanographic institutions, and its location makes it both a unique laboratory for natural science as well as a scientific destination for students, postdoctoral scholars and visiting faculty. Moreover, by all quantitative measures of research productivity, in terms of peer-review publications, grantsmanship, and major facilities, SOEST is a world-class and highly competitive scientific and engineering enterprise.

In addition to its outstanding international research, SOEST provides extensive service to the State of Hawai‘i, providing expertise in a wealth of critical subjects, including

- ocean resources and renewable energy;
- hydrology and coastal erosion;
- hurricanes, air quality and weather forecasting;
- volcanoes, earthquakes, tsunami;
- ecosystems, marine biology and fisheries recruitment
- ocean acidification, climate prediction and change;
- sea level variability and trends;
- ocean microbes and pathogens;

**Linking research and education**

SOEST is a role-model for integrating research and education that many universities should aspire to emulate. With respect to the School’s core educational function, the individual academic departments receive high marks for recruiting, training, advising and mentoring undergraduate students (see separate department reports below). Moreover, the research institutes and units are thoroughly engaged with educating and employing undergraduate students, and providing them with state-of-the-art research opportunities. The School has maintained a commendable record of running NSF REU summer programs that give students from across the US opportunities to do research in Hawai‘i.

SOEST’s programs have also reached out to the Hawai‘i and Pacific island communities in singular ways. The Pathways program has created a highly effective system for channeling promising
Hawai‘i community college students into SOEST undergraduate programs. The Maile initiative offers unique means to engage under-represented minorities (URMs) across the Pacific in science, engineering, research and discovery. Indeed, Maile has established an invaluable experiment and model for addressing the critical “pipe-line” issue that has nagged STEM fields across the country. The Sea Grant and Space Grant offices provide programs and funding for students to explore marine and planetary sciences. SOEST’s multiple summer programs – including several NSF Research Experience for Undergraduates (REU) sites – have done much to expose college and high school students to natural and planetary sciences.

In total, SOEST’s multiple efforts to integrate research, teaching and outreach are, by every measure, remarkable. These efforts highlight the inestimable value of an RO1 university in serving the State of Hawai‘i, not only in carrying out world-class research, or in providing invaluable expertise, but especially by training the State’s youth in state-of-the art science and technology, for their own, and Hawai‘i’s future.

Critical Issues

The work and dedication of SOEST’s administrators and faculty, its researchers and students and staff, are monumental, especially given the challenges of the current political and funding environment, both nationally and in Hawai‘i. The review committee identified three broad critical issues that the School must face in the coming years, issues that are pertinent to most, or all universities. The continued success of SOEST rests in addressing these problems head-on, progressively, creatively, and with the full partnership of the University and the State.

Budget stresses

SOEST exemplifies the enormous value of an RO1 university to the State of Hawai‘i by (1) training its youth in science and technology through well integrated education and research, and (2) providing expertise in natural resources such as water, renewable energy, and marine life, and in natural hazards such as volcanoes, landslides and coastal erosion. Budget stresses, however, jeopardize SOEST’s mission, including its continued operations of facilities and programs, recruitment and retention of faculty, and support for students and early career scientists. Serial cuts in university funding have left SOEST increasingly stretched for resources, with little ability to address rising concerns regarding the work-place environment (see below), to provide competitive start-up packages with which to recruit new faculty, or to maintain its research facilities and laboratories. For example, one of the unfortunate casualties of budget stresses was the SOEST Young Investigator Program, which was a prestigious prize postdoctoral fellowship, paid for by the SOEST Dean’s office and that served all departments and programs at SOEST. When in existence, this fellowship attracted outstanding candidates internationally, a number of whom went on to eminent careers as faculty at other major universities.

The University’s latest direction to tie tuition funds to enrollment in classes belies the work done out of the class room in advising students and engaging them in research. Moreover, despite major efforts by SOEST’s academic units to successfully increase their undergraduate enrollment and impact, the return in tuition revenue has remained effectively unchanged.

The committee must also note that budget stresses and the persistent erosion of funds appear to have driven the SOEST leadership into a triage mentality. The informal sentiment amongst a
number of faculty is that new ideas, requests or initiatives are typically met with an automatic “no” or “that’s impossible”. Regardless of budget stresses and forces beyond SOEST’s control, the leadership should encourage ideas and initiatives on their merit, rather than shoot them down simply because they represent an additional burden. While it is important to be honest about budgetary limitations, the leadership can also offer to work toward creative solutions and to make even incremental progress (which is still better than nothing), within the constraints at hand. Imparting only negativity and immobility is not what the leadership should be practicing, since that surely does nothing for morale.

Because the Hawai’i state budget and tax revenues are limited, SOEST must continue to find ways to support its programs beyond state/university funds. SOEST should reestablish the position for a dedicated University of Hawai’i Foundation representative to seek donors and industry partners. Building an alumni support network is crucial and involves a long-term perspective and investment of time and activities (alumni reunions, alumni advisory boards, etc.). Partnerships with industry should be encouraged, provided there are clear guidelines and a mutual understanding that industry-funded university research must be publishable in peer-reviewed journals, and never proprietary.

Since the external review took place, the committee became aware of recent news regarding the funding measures being considered by the Hawai’i State Legislature (http://go.hawaii.edu/GmV). The draconian and across-the-board cuts to the University proposed by the Hawai’i Senate (not the House) are, simply put, shocking. The wholesale weakening of University programs in research and education to the level proposed will be an irreparable step in eliminating opportunities for Hawai’i’s youth, and for driving away companies seeking technically skilled and educated employees. One can barely estimate the disservice and long-term damage done to Hawai’i’s citizenry and to the State’s future.

Thirty years ago the University and the State initiated a bold and remarkably successful experiment in creating SOEST. But both the University and the State must recognize that its premier scientific enterprise will not retain its excellence if it is continually starved of resources. Protecting the State’s investment in excellence must be a priority, or else it loses the foundation on which to maintain and build outstanding programs.

Mentoring of junior scientists

Graduate students: In surveying the individual academic programs, the review committee discerned that graduate students do not all experience the same quality of mentoring. Students are typically admitted to work on a specific grant with a faculty member, and thus students become primarily the responsibility of the advisor and much less that of the department or program. Thus in our interviews we found some students receive less guidance about expectations and progress than others, and there is a wide range of meeting frequencies with advisors (from daily to a few times per semester). Departments also do not have a consistent set of standards (i.e., between SOEST departments) about the review of progress for each student (i.e., committee meetings with students). In some instances, students found the lack of availability of necessary upper-level classes frustrating. Finally, given the increased efforts to have a more diverse faculty, there is a need to improve the culture of inclusivity with regard to both gender equity and representation of URMs, especially Pacific Islanders. Indeed the EARTH department’s students specifically requested that the department and school do more to follow the University’s model of the Hawaiian place of
Postdoctoral researchers: A subset of the review committee (SG and DH) met with representatives of the SOEST postdoctoral researchers on the second day (see prior schedule summary). That meeting revealed a number of problems with the current modes of support and mentoring of postdocs. First, the majority of these researchers are supported at UH (not just SOEST) through stipends; thus, they are not employees and are not eligible for standard benefits such as health insurance, which they have to purchase for themselves. While this is a cost-cutting measure to afford more post-docs on grants (although some investigators increase the stipend amount to compensate for the cost of insurance), it leaves these early career scientists in a vulnerable, at-will-employment limbo, with little access to support from the university for insurance, child-care, etc. In particular, these postdocs can be terminated if they become sick or pregnant. At some other institutions, unrestricted and/or pooled funds are used (in addition to either higher stipend rates or a taxable allowance for health insurance) to provide as close to similar benefits for postdoctoral fellows as for investigators. As the university and SOEST continue to diversify the sciences from the bottom up, this callous treatment of postdocs runs the risk of looking like gender and/or racial inequity.

Second, there is little systematic mentoring of postdocs. Any NSF proposal that seeks to support postdoctoral scholars must have a specific Postdoc Mentoring Plan, which outlines efforts done at both the Department and University level. This plan typically includes professional development activities, such as employment workshops and panels, and a consistent program in which postdocs present their research to a broad audience (not just their immediate research group) as practice for job talks. Rather than leave mentoring plans to individual PIs, SOEST should facilitate meeting this requirement by establishing school-wide policies and procedures for post-doc mentoring.

Finally, postdoctoral researchers have inconsistent experiences with their integration into the culture of any given Department or the School, i.e., beyond their immediate research group. Specifically, postdocs have no identity as a group and struggle to even know their fellow SOEST postdocs. A regular program for engaging postdocs in activities across a department or SOEST is highly recommended; e.g., invitations to organized graduate student social events, or ideally a regular postdoc seminar (which serves professional development as well).

Pre-tenure faculty: Although not all departments had untenured faculty available for interviews, several concerns arose. First, it is apparent that there is inconsistency with how junior faculty are recruited and most importantly hired. Specifically, the candidates apparently negotiate their salaries and start-up packages directly with the Dean, without a knowledgable intermediary (e.g., a Department Chair) playing the role of advisor as well as filter. Young inexperienced candidates thus negotiate significantly different packages (even for similar positions – i.e., not accounting for different start-up needs) depending on their language and negotiating skills, or level of advice from prior mentors (from none to thorough). This leads to both inequity as well as inadequacy in start-up packages, which can also lead to the impression of gender or racial inequity, depending on the cohort. While low-cost startup packages might seem like a good deal to the administration, significant long-term monetary and reputational costs are incurred if these packages are too small to allow the research programs of new hires to flourish. Moreover, the cost of living in Hawai‘i has been a perpetual barrier for early-career faculty recruitment, and University efforts
at housing assistance need to be more progressive and competitive.

Second, programs for mentoring junior faculty with advice about grantsmanship, service and teaching load appear to be inconsistent or lacking. Methods for professional promotion (e.g., internal committees to push nominations for fellowships and honors) is informal or nonexistent.

Third, heavy teaching and service loads are in some (not all) cases placed on junior faculty with little consideration for their need to build strong research programs for tenure. Although departments need to satisfy the demands for classes and committee work, the burden should be taken by senior faculty who have already achieved tenure. Again, because diversity efforts have largely diversified the junior faculty ranks, this inequity in service and teaching will look like gender and racial inequity. (It is already a problem at many major universities that women faculty have unusually high service burdens1.)

Finally, administrative assistance in writing, processing, budgeting and submitting proposals should be consistent and regularized across SOEST, especially for junior faculty trying to acquire their first grants with which to build their programs and groups.

Workplace Climate

Of all the interviews run by the visiting committee, none was more striking than the meeting with the Women in SOEST (WiS) group, who had provided a document – signed by more than 70 individuals – listing concerns regarding gender inequity and the workplace environment at SOEST. This issue is pervasive across all universities and is a national problem, hence the growth in scope of Title IX over the last decade. Universities across the country have worked to mitigate gender and racial inequity through various diversity initiatives and have increased hiring of diverse candidates, which have mostly been women. This is the case in SOEST as well. However, hiring and increasing numbers of diverse faculty is only half the battle. Universities must also retain them, not only through proper mentoring but also by creating a safe work-place culture that does not disadvantage these faculty with pre-existing biases, or create a toxic environment with any level of harassment or demeaning behavior. SOEST and the University of Hawai‘i could choose to be leaders in this critical issue. The WiS report indicates that the University must, at a minimum, be vigilant in examining and reforming its own environment.

First, SOEST and the University need to work together on establishing a regular university-wide mechanism to educate faculty, researchers, staff and students with formal training in topics such as Title IX regulations, standards of conduct and civility, the existence, forms and impact of implicit bias, and methods of establishing and securing a safe work environment including bystander training.

Second, the review committee concurs with the WiS group’s request that SOEST immediately establish a high level administrative position (Associate Dean level) within SOEST, in coordination with appropriate University offices (Title IX, Graduate Division), to

1. oversee climate, diversity, equity and cultural sensitivity,
2. provide a safe reporting structure that guarantees confidentiality and absolutely prohibits and precludes any form of retaliation or retribution,
3. develop substantive responses to infractions consistent with zero tolerance, and

4. provide regular reports on the number of incidents of sexual harassment, the nature of the infractions, the remedial action taken, and the outcome; redaction of names and other specific identifying information can avoid infringing on individuals’ privacy rights.

This position should be designed and established with the participation and assistance of the University so that it is well integrated with the relevant University offices; it could serve as an important role model for all the schools within the University. The schools and the University must then together develop standards of conduct and guidelines by which anyone found guilty of abuse or harassment through a fair and legal hearing (with representation that is properly trained in legal evidentiary review) should be punished appropriately (e.g., suspensions or release of employment), removed from the environment in which the abuse occurred, and mandated to undergo training or therapy. The response must be more than a slap on the wrist and/or a lateral promotion out of “harm’s way”. It is extremely important that such an effort be initiated immediately, not postponed because of budget issues or the bureaucracy of creating a new position. To address the latter, the existing Associate Dean for Academic Affairs could act as interim, with some of the current duties of that position shifted to others. Swift action would send a powerful message and begin the process of addressing this important issue.

Individual Departmental/Unit Reviews and Recommendations

Department of Atmospheric Sciences (ATMO)

During the SOEST Program Review, one team member (Dale Durran) specifically met with and interviewed ATMO faculty and students and visited ATMO’s facilities.

**Overview**  Atmospheric Sciences (ATMO) is a medium sized department with 11 full-time and one half-time faculty, which is almost identical to the faculty count (12) at the time of the previous 2013 program review. The faculty is very active in research, having been awarded $28.1 million in extramural funding in fiscal years 2013 through 2018, of which $10.6 million was received directly by the department and the remainder was received through the IPRC. The faculty published 383 refereed journal articles over the period 2013 through the present. The faculty has great expertise in the sub-disciplines of weather and climate science, both globally and in the Asian-Pacific region; they conduct research through observations, experiment, theoretical and data analysis, and numerical modeling. ATMO serves society and the State of Hawai‘i by acquiring and disseminating new knowledge about the weather and climate locally and globally.

Student enrollment in the department has been fairly steady. There are currently 28 graduate students and 9 undergraduate students, a count slightly smaller than the figure (30 grads and 12 undergrads) noted in the previous 2013 program review, however these numbers vary from semester to semester. During the last 5 academic years (2013/2014 through 2017/2018), the program graduated 26 students with BS degrees, 26 MS degrees and 10 Ph.D degrees. During this period, the faculty advised 56 post-doctoral researchers.

**Finding:** The department has taken steps to address the significant imbalance in the distribution of faculty seniority noted in the previous 2013 review. Although one of the two new hires mentioned in that review was lost to Colorado State University, additional retirements and
hires have brought the makeup of the department to 7.5 FTE of tenured full professors, one freshly tenured associate professor, and three assistant professors. The gender distribution of the faculty is skewed with all three women faculty members in the assistant and associate ranks. While the current strong reputation of the department is based on the outstanding research of the senior faculty, the junior faculty are the foundation for the department’s future. The four junior faculty are carrying heavy teaching and service loads. They play a major role in outreach and departmental service, in part because they are able to better connect with the undergraduates and the local citizenry.

**Recommendation:** SOEST and the department need to strongly support the development of the junior faculty’s research programs. Recognizing the value of the service and outreach conducted by the junior faculty, the senior faculty should either step in and shoulder more of this work or make some allowance for it in the distribution of teaching assignments to be sure the junior faculty are not overloaded. A committee should recommend teaching assignments after carefully assessing the teaching and service loads borne by each faculty member.

At the level of the Dean’s office, care should be taken to ensure startup packages are adequate to efficiently launch the research programs of new faculty. This reviewer was quite surprised to learn that it is apparently unusual to get support for one graduate-student RA in such packages. Other programs typically offer such support, and it can be done economically in the form of a backstop, where the first year of support is paid automatically, and second year will be provided if the new faculty member applies for a grant with student support and is declined. The backstop might also be extended for a third year if a second grant application is also submitted by the new faculty member and it is also declined. This is a very cost-effective way to help get a new professor’s research off the ground, and it grows the graduate student population.

**Findings:** The reviewer met with an impressive group of undergrads who represented a significant fraction of the department’s current majors. Their thoughts include the following.

1. There is strong interest in an introductory PYTHON-based coding course. Such a course could conceivably serve several different units in SOEST.
2. There is a strong desire to replace part of the material in Physics 272 (Electricity and Magnetism) with subjects more relevant to geophysics. The emphasis on circuits in the lab portion of course was deemed particularly excessive. Such a revised course might be of interest to students in other SOEST programs.
3. The students had trouble getting reliable advice about course scheduling. This is a serious issue because many important ATMO courses are offered only every other year due to the small size of the program. Central SOEST advising was not always aware of the specific years when particular courses are offered.
4. The undergrads are interested in serving as peer mentors for lower division majors, to help the department attract and retain freshmen and sophomores.
5. The classroom computers available to the students are not loaded with a uniform set of software.

**Recommendations:** The ATMO Reviewer recommends attempting to address all the preceding suggestions. This seems like a particularly good group of students to begin serving as peer mentors, and it would be good to give that a try while they are still around.
Findings: The graduate students voiced concerns about uneven teaching quality and unclear responsibilities for the two teaching assistants.

Recommendations: Even experienced, accomplished professors can occasionally benefit from a fresh look at their course materials and presentations styles. They should make an effort to keep their techniques/skills up-to-date using University resources such as the Center for Teaching Excellence’s teaching assessment services and the Assessment Office’s consultation services for program-level curriculum development. The responsibilities of the TAs should be clarified and held consistent from year to year.

Findings: Students and faculty both complained about the decrepit state of the HIG building. Building maintenance is often a challenge in times of tight budgets, but some of the problems really cry out for repair.

Recommendations: At least fix this large hole (below) in the ceiling of one of the men’s bathrooms. It has apparently been there for years and been reported several times. As is, it makes a pointed statement about UH to a wide cross-section of male visitors.

Department of Earth Sciences (EARTH)

During the SOEST Program Review, one team member (David Bercovici) met with and interviewed EARTH faculty, researchers and students.

The Department of Earth Sciences (formerly Geology & Geophysics) is SOEST’s second largest academic program (in terms of faculty size), after Oceanography, with 25 full-time faculty. The department does research and teaching in traditional fields of solid-Earth (or “hard-rock”) geology and geophysics, but also has significant overlap with interests in other units especially Oceanography. The department has historical strengths and eminence in volcanology, petrology
and geochemistry, in marine geophysics and seismology, and has strong groups in sedimentology and paleoclimatology (low-temperature geochemistry), and in local hazards and environmental geology such as coastal geology, landslides and hydrology. The department has a strong connection with the HIGP (for whom most teaching appointments reside in EARTH), as well as planetary astronomy programs at IfA, and much of the MGG division of Oceanography. The department’s research activity is high: from 2013–2017, the faculty raised more than $13.7M in external funding (with nearly 170 new grants), and published approximately 450 peer-reviewed papers. The faculty are internationally recognized researchers with a number of them having prestigious honors including fellowship in the National Academy of Sciences, American Geophysical Union, Geological Society of America and the Geochemical Society (to name a few).

The department offers a wide range of courses in geology and geophysics, for undergraduate, masters, professional masters, and PhD students. The department is particularly conscientious about meeting undergraduate needs. In response to the previous 2012 report, the department worked to increase its enrollment and its footprint in the university by developing on-line courses that can be taken remotely. This added feature caused a significant increase in overall enrollment. However, given the range of interests in three degree programs, the department is not always able to provide sufficient courses at the graduate level.

The student body of the department is not large, yet is respectable in size. There are typically 30-50 (on average 40) Bachelors students, approximately 20 Masters students and 30 PhD students. The number of Bachelor’s students appears small relative to many other units in the University, however it is typical of many Earth science departments across the country. The PhD program, however, appears somewhat low, but this is also a function of trends in external funding since most students are grant supported and only a small number (5) are supported on TA fellowships. The department is experimenting with admitting self-funded Masters students and this seems reasonably successful in getting good applicants who wish to gain a professional degree and work in the private sector.

**Faculty Concerns**

The review committee’s representative met with the Department Chair, his Faculty Leadership Council in the morning of Day 1, and all the tenured faculty in the afternoon. (The one untenured faculty member was away during the review.) However, faculty concerns will be addressed jointly here.

In discussion with the Chair and his Council, several critical issues came up, which were also reflected in later meetings with students and faculty. First, there is significant concern about the “graying” of the faculty. With a slow hiring pace and recent departures, there is only one untenured assistant professor out of 25 faculty, creating an unusual tenure ratio of 24:1; most universities typically have 3:1 or 4:1 ratios (which is merely reflective of rank duration, i.e., tenured faculty are in their positions 20-30 or more years, while untenured faculty usually 5-7 years). The department is understandably concerned about upcoming retirements (4 of which are apparently imminent) and plans for future hiring. The department’s self study alluded to future hiring plans that would seek to address societal and environmental needs.

Concerns about faculty graying and growth were also expressed in the meeting with the tenured faculty. The faculty also addressed concerns that while the fate of faculty hiring seemed precarious, there were also serious issues with maintaining research facilities, such as several of the scanning
and isotope analytical facilities that the department maintains. There is significant pressure to balance faculty size with the facilities that support their science. These prospects of zero growth and cannibalizing one’s own program has led to a significant morale problem amongst the EARTH faculty.

Funding for students was also an ongoing concern for the department. The department has worked hard to increase its enrollment (e.g., through on-line courses), but the tuition money returned to the department appears to have little correlation with these increased numbers. Graduate funding relies almost entirely on external funding, with only 5 TA-ships available for under-funded students; this provides little support for grad students, little support for teaching undergraduate classes, and few opportunities for many grad students to gain any teaching experience. It was commented that while the highly successful Oceanography GES program has more majors, many of its classes are taught by other departments; thus while it has 8 TA-ships, its actual teaching load is less than that for EARTH. However, rather than having the two largest SOEST units scrambling over a small pot of TA-ships, the university should recognize that these fellowship numbers need updating (they have apparently not changed in many years). Finally, while the Department (like other SOEST units) has worked hard to integrate teaching and research, this effort has been almost entirely externally funded with little help from the University.

As the demand for greater undergraduate enrollment has increased, the department faculty have struggled not just with assigning instructors for courses, but providing consistent and systematic undergraduate advising that does not over-burden a few faculty. The Department leadership seem keen to move toward an advising and management model akin to that in the GES program run by Dr. Michael Guidry.

**Student Concerns**

The review committee representative met separately with the undergraduate and graduate students on Day 1. Each group expressed many positive aspects for the program but also had some unique concerns.

**Undergraduates:** On the whole the EARTH undergraduates were very enthusiastic about the Department. They felt they received much more attention from the faculty than they would in other programs from which they entered, including better and more careful advising and more opportunities for social interaction with peers and faculty, as well as numerous research opportunities. A few students had some minor complaints regarding the preparation for the BA (not the BS) in which a field methods course was required, but the pre-requisites for this course (e.g., mineralogy/petrology and structural geology) were not required.

Also some students enrolled in what should be an important skill class on computer programming in geoscience were frustrated with the use of the language R as opposed to MATLAB, which seemed to be a whimsical choice by the instructor. Although this seems like a minor complaint, this reviewer recommends that an important course like that be structured in a regular and consistent way and perhaps taught SOEST-wide since it would be invaluable to all SOEST students. It should not be a “hobby” class subject to casual experimentation (such experiments should be saved for upper level seminars).

Finally there was a consistent complaint that the UH General Education (GenEd) requirements were frustrating, specifically that there were too many, and many were not well taught. The re-
viewer notes that this is not an unusual complaint amongst undergraduates in many liberal arts universities. However, the SOEST undergraduate advising team – who seem well focused on getting students through their science and major requirements – might be engaged further in the GenEd and Arts & Sciences advising.

In discussing career aspirations, the reviewer was particularly impressed with the level of ambition from the EARTH majors. One subset of students wanted to go work in the private sector or for the government in environmental management, disaster mitigation, or forensic science (and a subset of these hoped to stay in Hawai‘i after graduation). The largest subset of students expressed a desire to continue in science and go to graduate school, either in Masters or Doctoral programs. They all felt that they had received excellent training and important experiences in research. Indeed, most of the students interviewed were very excited by their research projects and seemed to have very clear ideas of what they wanted to do afterwards, although this may not be a representative body for the entire undergrad EARTH population. Since the research experience (with excellent advising) was so formative for these students, it was somewhat of a surprise to the reviewer that the undergraduate thesis (or essay) is not a formal requirement, especially since most of the students are doing it anyway.

**Graduate Students**  
One of the major topics raised with the reviewer by the EARTH graduate students (some of whom skyped in from a conference) was about having the department do more to follow the University’s model of a *Hawaiian place of knowledge*. Specifically the students wanted to see greater awareness and sensitivity to Hawaiian culture and standards in how department classes are taught and how field work is carried out. For example, the gathering of geological samples is deemed too glib or casual, with little consideration for local traditions about removal of rocks. From the reviewer’s perspective, it is often difficult to reconcile scientific needs with local or religious traditions; however, the EARTH faculty should work with and consult with UH faculty in, for example the Hawai‘inuikea School of Hawaiian Knowledge, and specifically the Kamakakuokalani Center for Hawaiian Studies, on how to find some workable common ground (if they have not done so already – it was not apparent either way). For example, EARTH faculty and graduate students (especially those in teaching positions) would benefit from basic training in cultural sensitivity, in the same way that Title IX offices provide training in gender inequity, harassment and implicit bias.

The students also expressed concern and frustration with the lack of Pacific Island URM representation in the EARTH faculty, which is basically zero, and that there seemed to be some bias against hiring EARTH grad students – a number of whom are Pacific Islanders – back into the program as faculty. The reviewer discussed this with them and that this is not a department or university issue but one that all major research universities face. In particular, hiring faculty from outside one’s program is generally considered important for cross-fertilizing ideas and approaches and not developing narrow “schools of thought”. Naturally, exceptions can occur and should be allowed for, especially for exceptional candidates who offer both exciting research and educational directions as well as opportunities to diversify the faculty population. At some other institutions, exceptions are also sometimes made provided that candidates have carried out postdoctoral research elsewhere, following their PhD, and prior to starting as faculty. Students from Hawai‘i who apply to the PhD program should be made aware of these issues when they are being recruited.

The graduate students also were frustrated with how TA-ships were distributed. As the faculty
and Chair also noted, the department gets very few such teaching fellowships (only 5). There are a few students who do not have sufficient grant funding from their advisor and who are locked into these TA jobs, leaving them little time to do research. On the other hand, students funded on RA-ships through grants rarely if ever get a chance to teach and gain that important experience for future employment. Understandably, budget constraints leave little flexibility for how grad students are funded; however, graduate training is one of the University’s most vital roles and if the strictures of the funding model are failing the students then it should be impetus to find a better model. For example, students on RA-ships might be allowed to help with teaching, even in teams to reduce impact on their research requirement, and thus partially relieve the semi-permanent TA’s of their obligations.

The structure of graduate student advising received both positive and negative feedback. On the one hand, the Department’s graduate committee maintained regular oversight and meetings during the year to check on the status and progress of each student. (This was even noted to be a model program that other SOEST departments should follow). However, individual mentoring and advising from PhD adviser was inconsistent; for example while one student had multiple meetings with their advisor per week, another said they barely had annual meetings. This disparity is troubling and department should provide some protocol or strong recommendations for frequency of adviser meetings.

Lastly, grad students complained a bit about the physical work environment. Specifically, many work in cubicles with no windows, in offices with excessive air conditioning, in some cases ceiling tiles have collapsed on their desks because of excess precipitation brought on by the air-conditioning. (The reviewer agrees about the excessive air-conditioning; building a giant glass green-house building like POST in the tropics was somewhat questionable; but then over-air conditioning it as a result, causing some people to use space-heaters to offset the temperature, hardly makes the building a paragon of energy efficiency and environmentalism. It must have a LEED rating in the deep negatives.) There were also complaints that the POST building entry doors are perpetually broken, allowing anyone to get into the building, which was concerning for students working in the building late at night.

Summary Recommendations

1. The nominal size of 25 EARTH faculty is appropriate for the fields covered. However, a plan must be in place to deal with imminent retirements or else the department will find itself significantly weakened. The department should compose a strategic plan for future directions that gather information from outside the department by whatever mechanism necessary, e.g., exploratory symposia, inviting individual scholars to discuss their vision, or sending department representatives to peer institutions. Of course these approaches require resources, but they pale in comparison to the resources expended in running a search, which then pale to the cost of hiring a new faculty member; thus small investments up front make for wiser spending later. Moreover, determining future directions within closed walls or in an echo chamber runs the risk of holding legacy or “cloning” searches.

2. The EARTH self-study document conscientiously sought to look at societally and environmentally relevant future directions, which is commendable. However, the department should not shift so hard toward environmental issues that it loses its eminence in core research areas, which are fundamental to understanding our planet, but might not be immediately societally
relevant (e.g., planetary science). Astronomy departments are about making discoveries and are not generally expected to solve humankind’s problems; some components of Earth science departments exist in that mode also.

3. The EARTH faculty have made a conscientious effort to enhance the department’s undergraduate teaching profile, with revised classes, on-line courses, conscientious advising, undergraduate research, and strong engagement in summer programs for improving the science URM pipe-line and research experience for undergraduates. However, while this effort has seen marked success in its impact and enrollment, it seems to have gained little reward, with little to no change in the tuition revenue returned to it, no change in the TA support, and little support (or credit) for engaging undergrads in research (which is one of the major advantages of an R01 university). While the state and university budget are perpetually tight, the university must recognize the erosion of morale with unfunded mandates to improve education and expand the mission of the faculty, but give little back in return. We strongly recommend that SOEST and UH develop a progressive plan to encourage – not discourage – the constructive efforts of EARTH faculty. Rebalancing the TA-ships and return of tuition revenue would be an important first step.

4. The EARTH department is a pre-eminent research department, and while the faculty have willingly partnered with the University to enhance its educational footprint, little has been done to support its research mission, which is crucial both for its standing and for offering students a unique scientific experience. For example various analytical facilities are under-funded, in disrepair and/or out of date, and the faculty are left to deal with these, or let them go fallow. We strongly urge the University to recognize that state-of-the-art facilities are crucial for keeping Hawai‘i’s students competitive in their scientific education. At the very least the school and university should find ways to match or under-write (i.e., back-stop) proposals for instrument upgrades or replacement.

5. While the undergraduate EARTH students appear highly satisfied with their experience a few features can be improved. The department should consider formalizing the undergraduate thesis (or some similar experience) ; and this would be consistent with the other major SOEST program in GES. To deal with the teaching load across the school, courses common to all students in SOEST, such as applied math and computer programming, should be taught as SOEST wide classes, and given a consistent and reliable structure.

6. The EARTH graduate students are reasonably well tended by the department, but several issues warrant recommendations. The department should be sure that cultural sensitivity training be required of those in instructional and advising positions, including those doing field work. The department should find ways to equalize the teaching-assistant load so that students supported by TA-ships have more time to do their research, while students on RA-ships can gain some teaching experience. The department should work with the students and SOEST in improving their physical environment, from the building thermostat to its security, the latter of which constitutes a serious workplace climate issue.
Marine Biology Graduate Program (MBGP)

During the SOEST Program Review, one team member (Dennis Hedgecock) specifically met with and interviewed MBGP faculty and students, and visited MBGP facilities.

Hawai’i has a naturally strong connection with ocean life. The University of Hawai’i Mānoa (UHM) inevitably attracts local, out-of-state, and foreign students interested in pursuing post-baccalaureate degrees in marine biology. Beginning in the mid-1990s, the university offered an interdisciplinary graduate Certificate in Marine Biology, but a number of organizational problems led to its demise by 2011. In its place, UHM established a provisional Marine Biology Graduate Program (MBGP) in AY 2012, as a joint program between the College of Natural Sciences (CNS) and SOEST, offering both MS and PhD degrees. The program has two faculty Co-Directors, one from each unit.

At launch, each Dean contributed very modest operating funds, a small amount of equipment, and half the salary of a whole temporary program coordinator, recently made permanent. In addition, SOEST allocated two rooms in HIG for office and non-laboratory instructional space. However, no new faculty lines were allocated to the program, with the idea that, by drawing on existing graduate faculty and courses in CNS and SOEST, along with a host of affiliate faculty from relevant federal and state agencies, the new program could efficiently offer flexible, individualized graduate training in marine biology. The program has largely realized that vision, though opportunities for improvement remain. The Review Committee supports approval of the program’s current petition for established status.

MBGP has significant strengths. It serves as an intellectual bridge between SOEST and CNS, the original home of SOEST’s Oceanography Department. It is a large graduate program, with approximately 40 active and well-funded graduate faculty, drawn from five different departments and two ORUs, 14 affiliate faculty, 60 students, and 80 to 100 applicants per year. Students are scientifically productive. From 20% to 30% is supported by competitive fellowships. Though the program is too young to have established a track record of placement for its PhD students, it has evidently placed its initial cohorts of MS students, many in state and federal agencies, fulfilling a principal program objective of training marine biology professionals. Faculty and students alike cite the opportunities for individualized educational trajectories as the most positive attribute of the program. Likewise, faculty and students seem pleased with the program coordinator and IT staff support.

MBGP also has some obvious opportunities for improvement. The program has yet to articulate clearly the core principles or competencies in marine biology, in which all of its students, no matter their ultimate end-points, should be indoctrinated. At present, the program lacks a rigorous, first-year core course imparting fundamental knowledge and methods. Instead, first-year students are united only by a two-semester succession of one-unit classes in career skills and current topics, which are important but not fundamental courses. The rest of the curriculum is heavily laden with variable-unit, seminar courses, which are apparently offered inconsistently. A graduate program celebrating flexibility and customized learning trajectories, nevertheless, needs an intellectual coherence to establish its identity and to be competitive for training grants, which could raise it to national and international prominence.

A principle reason why the program lacks a rigorous core curriculum and consistent offerings of advanced graduate courses is that MBGP has no faculty per se and its Co-Directors have no control over faculty teaching assignments. Thus, ironically, the current academic structure, a source of
efficiency, is at the same time an impediment to building an academic identity for the program. In addition, the program is physically spread widely over many departments and ORUs, impeding a sense of community among students and faculty. Finally, the program has no teaching lab space, which could be dedicated to core or advanced courses.

Co-leadership by faculty from two different schools, an arrangement that could be fraught with clashes in academic culture and personality, appears to be working very well, owing to the combined knowledge, institutional memory, and cooperative spirit of the individuals currently in those positions. Nevertheless, much of the program’s inner workings appear to be informal and not institutionalized; there appears to be no clear plan of succession for these critical Co-Director positions.

The two schools responsible for MBGP have grossly different pay schedules for graduate research and teaching assistants. The difference in pay between two students in the same program, doing the same job, one from SOEST and the other from CNS, is $6000 per year, a substantial, demoralizing, and indefensible inequity.

The program is losing a fisheries science faculty previously supported by federal funds. Fisheries science is a key area for the MBGP, enabling to place its graduates in fisheries management positions in state and federal agencies.

**Recommendations:**

1. In concert with seeking permanent status for the MBGP, the faculty should identify its unifying core principles and strengthen its curriculum. A first-year sequence of rigorous core courses, followed by flexible trajectories through routinely offered advanced courses, would make MBGP more competitive for a training grant. The MBGP faculty should hold a retreat to discuss and chart the next phase of the program’s development.

2. The MBGP has far less capacity to staff and to offer regularly its core and advanced graduate courses than might be expected from its large faculty, because faculty from CNS and SOEST have teaching obligations in their respective units, not in MBGP per se. That UHM faculty can be tenured in an ORU offers one potential solution to this problem: An increase in MBGP faculty with graduate teaching loads dedicated to the MBGP curriculum could come from hires (underway, planned, and new) in ORUs, such as HIMB and PBRC. The program’s request to hire four new faculty seems reasonable, especially if it coincides with replacing positions in ORUs, and on a scale that could make a big difference in the program’s curriculum. Hiring someone in fisheries science should be a high priority, since training professionals for state and federal regulatory agencies is one of the program’s most visible value propositions.

3. MBGP should have a charter to formalize its relationships to the supporting schools and a succession plan for its Co-Directors.

4. CNS and SOEST, together, should remove the inequity of RA/TA pay for MBGP students.

5. Currently, MBGP has a majority of white students (57% vs. 26% in the State of Hawai‘i). There is a tremendous opportunity to entrain more Native Hawaiian and Pacific Islanders into MBGP, by coordinating with the various SOEST programs working on the STEM pipeline for underserved minorities.

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Department of Oceanography (OCEAN)

One team member (Meg Tivey) met with faculty, graduate students, and undergraduate students within the Department of Oceanography, and toured facilities.

The Department of Oceanography is a large department that carries out research and education in three “divisions” - Biological Oceanography, Marine Geology and Geochemistry, and Physical Oceanography - offering BS, MS and PhD degrees. Currently the department has 30 tenure-track faculty, 8 non-tenure-track faculty, 36 research affiliates, 14 emeritus/emerita faculty; additionally there are 16 persons not employed by, but who have graduate faculty status with, the Department of Oceanography. The Oceanography Department has a clearly articulated vision and mission that integrates education and research, with course instruction and student advising carried out by active researchers in marine, coastal, estuarine, climate, and environmental science. The Department investigates the ocean at local to global spatial scales and from past to the future with strong emphasis on and expertise in oceanographic knowledge for the Pacific Region.

The Department faculty members are active and highly successful in research, publishing on average 4.7 peer-reviewed publications per year. Several Department of Oceanography faculty also serve in leadership positions in different University of Hawai‘i research centers, including the International Pacific Research Center (IPRC), the University of Hawai‘i Sea Level Center (UH-SLC), the Joint Institute for Marine and Atmospheric Research (JIMAR) and the Daniel K. Inouye Center for Microbial Oceanography: Research and Education (C-MORE). The latter includes the Simons Collaboration for Ocean Processes and Ecology (SCOPE – a 10-year grant), and, in collaboration with other Oceanography faculty, leads the Hawai‘i Ocean Time-series (HOT) program (renewed through 2023); C-MORE has brought in more than $29M in extramural funding over the last six years. The success of the research enterprise within the Department of Oceanography is highlighted by its success in obtaining in excess of $51M in extramural funding over the past 6 years.

Faculty Concerns

Coupled with the Department of Oceanography’s success are several stresses felt by faculty, primarily related to budgetary limits. Most frequently mentioned was the need for support for proposal preparation (with budgets and supporting documents), and also with access to graphics expertise; support would particularly benefit junior faculty who submit more proposals. Another major concern is with recruitment and retention of faculty. The department has gone from a tenure-track faculty of 37 to 30 since the last review, and is currently undergoing a search for three MGG faculty. Concerns with recruitment of faculty include low start-up packages, the high cost-of-living in Hawai‘i (with a recent hire opting to leave after less than three years), and the quality of facilities. With respect to the latter, there have been improvements since the last review. The Marine Science Building’s elevators and air conditioning have been renovated and a Computer Lab and an Environmental Embedded Systems Lab have both been established, with renovations planned for a new wet teaching lab and for two other classroom spaces. However there are still recurring issues with mold, particularly in the upper floors of the building. An additional wish-list item is to establish a coffee shop on the ground floor to serve as a communal gathering place within SOEST to foster community and interactions across all disciplines. Additional concerns raised by the 21 faculty who met with the team member were issues with procurement and other fiscal services being very
slow to respond; the increasing administrative burden on faculty; and a need for revitalization of labs and better equipment for use by undergraduates, though this latter need is in part being addressed. An example attributed to budget cuts that were then never restored include the loss of the student cruise. Concerns were also raised about access to the sea and data collection in the Pacific, with the loss of a ship and tender for submersibles. Overall the main concern was summarized succinctly as a constant squeezing of funds and cutting of services that is preventing faculty from tapping its full potential.

Final topics raised by the faculty were the need for formalized mentoring of junior faculty, a need to be proactive when it is evident that there will be retirements in the near future, and issues with workplace climate. Faculty mentioned that those who retired were dedicated instructors and advisors, and the loss has been felt. Faculty also noted that a reactive stance to those retirements resulted in “needless negative effect.” The issue of workplace climate, particularly for members of underrepresented groups, including female faculty, is a SOEST-wide issue and is discussed in detail in the section on SOEST-wide programs and issues.

**Student Concerns**

**Undergraduates:** The Department of Oceanography has a very impressive undergraduate program, Global Environmental Science (GES), which has been in operation since 1998 and now has 73 majors, making it the largest undergraduate program in SOEST. It is clear that the program has been nurtured, with improvements made to address issues, resulting in a highly satisfied student body. The 11 undergraduates who met with the team member praised the breadth of topics, the diversity of people/backgrounds/interests, and the welcoming environment (an example provided was that the environment is much more communal and welcoming within GES than elsewhere to premed students). The students are able to congregate and work and socialize together in the GES lounge, which is very advantageous for commuters and for those who otherwise would study in their dorm rooms. The students praised the quality of mentoring within the GES program, the ability to speak with professors, and the small size of classes (most have 10 to 20, and at most 30, students). The students are impressed with the relaxed “nonchalant” atmosphere, and they appreciate that faculty reach out to them and understand when classes might be missed for fieldwork. Students also praised how issues that arise are addressed and solved. For example, a past issue of students not identifying thesis topics early enough to finish in four years has been resolved through encouragement and reminders to identify a topic early (in years 1 and 2, though most identify the project early in their junior year). There also are a few general education classes (e.g., Math 242, Phys 272) that are difficult and that many GES students take more than once; the presence of a SOEST teaching assistant as a tutor was mentioned as a useful resource. Expectations for GES students are clear, with required semester meetings between each student and his/her undergraduate advisor to keep students on track. Recently, at the suggestion of faculty, a GES student committee was formed and this committee will be assigning near-peer mentors to each incoming GES undergraduate in hopes of increasing retention during the first few years of the program. Of note are: the ethnic diversity among GES students is high; the majority (7) of the juniors and seniors who met with the team member had done a summer internship (Research Experience for Undergraduates); and thirteen former GES students have been accepted into the Department of Oceanography graduate program, helping to increase diversity within that program as well; plans are under discussion to incorporate a “4+1” course-based masters degree option
within the GES Program to meet the needs of working professionals.

**Graduate Students:** The Department of Oceanography graduate program offers diverse research opportunities in biological oceanography, marine geology and geochemistry, and physical oceanography, and is well structured with a handbook that clearly outlines procedures in the three divisions. Recent retirements and resignations of several faculty have affected several courses, and led to a decrease in enrollment, primarily from fewer offers having been made (only 10 in 2015-2016, 13 in 2016-2017, and 9 in 2017-2018, with yields of about 60 to 70%, resulting in a decrease in student enrollment from >50 to a low of 36 and now rebounding to 43 in fall of 2018; for doctorate students there was a decrease from >40 to a low of 24 in 2017-18 to 27 in fall 2018, and for masters students an increase from <10 in 2013-14 and 2014-15 to 16 in fall 2018). The faculty is confident that graduate student numbers will increase as new faculty come on board.

The graduate students who met with the team member, or provided written input in advance of that meeting, had one major and several minor concerns. The major concern centered on advising and mentoring. Minor concerns included variations in stipend levels, in particular lower pay for TAs than RAs (a UHM issue, not restricted to Oceanography). There were concerns raised about availability of classes, not knowing what courses will be taught in what years/semesters to allow planning, with issues then arising due to missed prerequisites causing postponement of needed classes. This was an issue that was also raised in the previous review that has likely been exacerbated by low enrollment. Some students recommended that there be a PO class for those in non-PO disciplines, but the philosophy of having all students take courses together in all disciplines was appreciated. Another recommendation was for a physical chemistry course for geosciences and oceanographers to provide better context to systems in which students will be applying the concepts (several programs elsewhere take this approach). There was also recognition of the loss through retirement of some excellent instructors, and a recommendation for efforts to be made to entrain enthusiastic instructors interested in updating lecture and lab content (and not leaving the task of updating lab assignments to TAs). Another concern is with a lack of funds for travel to meetings, and having to wait to be reimbursed to recoup travel costs. A suggestion was also made to post a list of scholarships, grants, and TA opportunities for those in need of additional funding for life, conferences/travel, or research.

The majority of comments from the graduate students focused on advising and mentoring. Specific issues raised included: disparities in advising/mentoring with apathy and bullying being of major concern; a need for expectations to be clarified between advisors and students; perception that the only resources for resolving concerns or conflicts are the advisor, committee members, or Graduate Chair, and that committee members are biased toward the advisor; an absence of an impartial person to contact about issues (e.g., an ombudsperson). The students reported that the handbook is confusing (though the team member found it clear and straightforward to navigate). Suggestions from students to address these issues include: establishment of a committee similar to that in Earth Sciences to do annual reviews; require an Independent Development Plan in year 1 and revisit it annually; enforce semester reviews with advisors; clarify the annual review process (students are unclear whether feedback is on their presentation or on their progress toward degree, and they would appreciate the latter at least annually); emphasize constructive criticism; require biweekly meetings with advisors. Another concern was with the added time to PhD if pursuing a masters degree first. Students indicated being told that completing a masters first adds only about
6 months when in reality it adds more (and if one looks at the flow chart on page 7 of the graduate student handbook it does look like it would add more than 6 months). Workplace climate issues were also reported, including: a lack of community feel among students (though they do have a lounge in MSB); a need for wellness classes to address stress/anxiety; a lack of professional development opportunities; a lack of clarity about who to go to with issues; and a lack of diversity, including gender diversity, among the faculty.

**Summary Recommendations:**

1. Efforts should be made to address budget stresses, many of which are common across all departments within SOEST so are detailed under the SOEST-wide programs and issues section of this report.
2. An effort should be made to reinstate the student cruise or other avenues for providing time at sea to graduate students who are required to carry out 30 days of field work including 3 days at sea.
3. Guidelines should be developed for mentoring of junior faculty through tenure. Planning should be done that anticipates retirements to allow efficient rejuvenation of faculty.
4. The GES Program is in excellent shape. Given its strength and health, the review team supports and recommends that GES explore securing ABET Environmental Science Accreditation for a track in the degree program: a GES-ABET Environmental Science accreditation. The current undergraduate Chair, Michael Guidry, is well aware of the enormous effort this represents and is willing to lead it. Such accreditation would allow students interested in receiving an accredited degree to do so within the GES Program within its current curriculum structure. This would make the SOEST GES Program one of the first undergraduate science degrees with an engineering accreditation, increasing the program’s reputation and the job potentials of graduates of the program. The only other recommendations for the GES Program are minor - to continue to listen and address student concerns; consider adding a research-based statistics course taught within SOEST because otherwise the material is taught focusing on either economics or botany; send reminders to students to check the web site for thesis project ideas; create some all SOEST undergraduate activities, or a social club for SOEST undergraduates; hold across-UHM STEM events.
5. Recruitment of graduate students from the GES program is working well and is resulting in a more diverse graduate student body, but there is no formalized recruiting into the Department of Oceanography outside of Hawai‘i (unless there is a SOEST booth at AGU or Ocean Sciences). Efforts to recruit using social media, web sites, and faculty contacts at other universities and colleges could be implemented to increase applicant pools. Numbers of offers and yield should be tracked in upcoming years to ensure continued rebound from the low enrollment of 2017-2018.
6. Rejuvenation of faculty offers an excellent opportunity to review and update course curricula. Annual schedules of courses, and particularly of graduate courses, should be created that are predictable, with sequences that allow low enrollment courses to be taught biannually.
7. Faculty should be encouraged to include travel for graduate students to attend more than one meeting within grants, and information about funding opportunities for students should be posted where it can be readily accessed when needed.
8. Efforts should be made to consolidate and list all graduate student resources in the Depart-
ment of Oceanography Graduate Student Handbook, and make it available to all advisors. There is a wealth of resource materials on advising and mentoring of graduate students on the Department of Oceanography web page, within the graduate division (including advising, counseling, and mentoring resources), and in various offices within the University (SAS). The current Graduate Student Handbook does include partial lists of resources to go to with informal or formal complaints, but it is incomplete. Graduate students would benefit from knowing that resources include their initial advisory committee members and then their outside department committee member, all of whom are considered to be impartial committee members. The Graduate Division is another important resource where students can either go in person, or call anonymously to ask questions about behavior, issues, or available resources. The advising and mentoring approach used within the GES Program could be used as a model for graduate students and postdoctoral researchers with appropriate modifications. Again, a key component of that successful program is centralization of information. SOEST Student Academic Services (SAS) provides considerable support, though most appears geared toward undergraduates. Similar support services specific to graduate education, and for postdoctoral researchers, could be developed and centralized within SAS.

9. Implementation of graduate student suggestions listed above should be considered, including establishment of a committee similar to that in Earth Sciences to do annual reviews.

10. A mechanism should be put in place to ensure that all graduate student advisors are aware of best mentoring and advising practices. This could be as simple as holding a required annual hour-long workshop for all advisors to review the UHM Faculty Guide to Mentoring Graduate Students, and the mentoring and advising responsibilities outlined at http://manoa.hawaii.edu/graduate/content/standards-responsibilities. A similar annual mentoring workshop for graduate students to remind them of all support resources (e.g., at http://manoa.hawaii.edu/graduate/content/current-students) could also be implemented.

Department of Ocean and Resource Engineering (ORE)

During the SOEST Program Review, one team member (Stéphan Grilli) specifically met with and interviewed ORE faculty and students, and visited ORE’s facilities.

Overview: Ocean and Resource Engineering (ORE) is a small department within SOEST of currently 6 tenure-track faculty, 5 instructional and 1 research, offering MS and PhD degrees. ORE’s MS degree is the only ABET accredited Ocean Engineering MS degree in the US (7 other ocean engineering programs have ABET accredited BS degrees). Despite the small faculty size, as is typical in this field, ORE’s faculty expertise, research, and educational activities cover many different specialties, such as ocean waves and hydrodynamics, fluid-structure interaction, offshore and coastal engineering, ocean acoustics, seafloor observatories, marine renewable energy, and offshore resources.

The ORE faculty is very active in research, well published (about 4 papers per year, per faculty in the past 6 years) and well cited, with most faculty having significant research funding. In the past 6 years, ORE’s yearly extramural funding has ranged between $900K and $1.5M, which amounts to $150K-250K per faculty per year, a commendable figure considering that ORE mostly consists
of teaching faculty. While being successful with research proposals, the faculty reports issues with paperwork (regarding purchasing and grant accounting), administrative delays, and in general a lack of help in proposal preparation.

Since 2012, the total student enrollment in the department has gradually decreased from 30-40 (2005-2012) to 15 students in the Fall 2017; the majority of students are international (7 of the 9 students one team member interviewed were international). The reason for this decline in enrollment is not entirely clear since the department has two (2) Teaching Assistant (TA) positions and based on their substantial research grants, there should regularly be some new GRA positions available in the department. One may attribute part of this decline to several factors: (i) time to graduation appears longer than typical in similar engineering programs (see discussion later), which yields low graduation rates (3/3/4 MS awarded and no PhD in past 3 years); (ii) since 2012, the number of student’s applications has gradually decreased, with the yield (enrolled versus accepted students) staying at about 50%; and (iii) some faculty have been employing postdocs on their research projects (numbers not provided), who under the stipend-based SOEST model, which incurs a reduced overhead rate, are quite financially attractive to PIs.

Despite the downward student enrollment trend, the department has been given permission to conduct 3 searches for TT positions at the junior level, one to replace a retirement and two to reinforce the department in developing ocean engineering areas (e.g., marine robotics and acoustics). This is a testimony to the strong support that ORE and the faculty’s areas of work enjoy within SOEST and the University, and supporting ORE is viewed as important to the state of Hawai’i. Partly in response to the downward graduate enrollment trend and partly due to the strong employment market for ORE graduates, the department has decided to explore the implementation of a BS degree, as an ORE track within an “Engineering Sciences Program”, in collaboration with other SOEST units and operated within the College of Engineering (COE). This program would be seeking ABET accreditation.

**Findings:** As already pointed out in the report of the 2013 SOEST Program Review, and similar to some other units within SOEST, ORE’s facilities appear to be barely adequate to fulfill the program educational and research objectives: (i) there seems to be a lack of maintenance in some buildings/space (or at least a very long time frame to perform repair or maintenance work); (ii) staff complains about air quality and temperature regulation in all buildings; (iii) ORE has an inadequate amount of laboratory space, with some space being very crowded and some equipment being operated in the open space outside buildings; (iv) ORE’s cabled offshore ocean laboratory has been down since 2012; (v) faculty and student offices are dispersed over 4 buildings, which while not being at a large distance from each other, cause enough of an obstacle to prevent easy and informal communication within the department; (vi) classrooms need basic refreshing, maintenance, and upgrading (this is a school-wide issue). On the positive side, everybody (staff, faculty and students) appears satisfied with the IT department, although some websites appear to be dated.

Nevertheless, based on the team interviews, there is a good collegial atmosphere among faculty and students, and there did not seem to be any problem in ORE in this respect, except regarding one staff member. Graduate students interviewed appear happy about their studies and made some constructive suggestions for improving the curriculum; they report that most professors (but not all) are easily accessible to students. The minor items have already been reported to the ORE faculty. Regarding larger scope issues, some students ask that: (i) more higher level (modern research)
classes be offered; (ii) an applied math class be offered; (iii) the department have more of the modern software resources (students access some of these in the COE as a “favor”); (iv) the issues with the problematic ORE staff member be resolved; (v) ORE acquire a longer wave tank better suited to energy research; (vi) the working relationship with the COE be improved (regarding in particular pre-requisite engineering classes, but not only) (the ORE faculty strongly pressed this issue during their interview with the team as this delays students in their MS work); (vii) they receive more exposure to the industry and company work end environment; (viii) the resource side of ORE be expanded; (ix) some more practical design oriented classes/projects be offered, besides modeling related classes; (x) research fellowships and other openings be better advertised within ORE.

**Recommendations:** ORE appears to have strong support within the school and the university administration, particularly in terms of new faculty positions. To fulfill their potential, however, ORE needs proper facilities and staff support, and particularly to be provided with adequate pre- and post-award grant services, and a streamlining of paperwork in general. ORE faculty, staff, and students would greatly benefit from consolidating their activities and offices within the same building, rather than being spread-out on campus, as is currently the case. In view of their hiring plan and the potential implementation of an undergraduate (UG) program, ORE will clearly need more quality laboratory space.

Considering the current low graduate enrollment, ORE’s plan to implement an UG program is viewed by the review team as a strong opportunity for growth, both within ORE and SOEST. The review team is thus recommending that this plan be fully supported by the school and the University, with proper help from the school and the COE, and adequate resource allocation. Current laboratory space in ORE is clearly insufficient to operate a quality UG program. Besides increasing revenues for ORE/SOEST, having an UG program would allow ORE to recruit some of their top seniors as MS students, perhaps as part of a streamlined and accelerated MS degree. This would thus also help increase ORE’s graduate enrollment.

The review team also strongly support ORE’s plan to more actively recruit new MS students, who are professionals in the local ocean industry and could be part time students and to better help accepted student applicants find fellowships and scholarships.

New faculty hiring will be important for ORE to further increase their research impact and visibility, and achieve adequate critical mass to offer classes that properly cover the breadth and depth of necessary topics (both core courses and specialized courses). This will allow addressing some of the current students suggestions (see graduate student comments above), but also having enough “manpower” to offer new classes as part of the proposed new UG program.

ORE clearly has a faculty that is highly productive in research. New faculty should be hired with competitive start-up packages that will ensure their success and integration in ORE’s research culture. A strong mentoring system should also be implemented for the new hires. To free faculty time for writing more proposals and papers and performing more research, the school and university should streamline paperwork (i.e., switch to all electronic forms and approvals), reduce administrative delays, and provide pro-active staff help for pre- and post-award tasks (this recommendation is likely applicable to the entire school). Training SOEST staff to help faculty with proposal preparation (such as Fastlane and Grant.gov) would likely prove beneficial in the long term.
The COE needs to better support ORE graduate students who have to take pre-requisite classes in engineering. Establishing a more collegial relationship between the COE and SOEST will also be necessary in the context of an UG program operated and delivered in collaboration with the COE. The administration is encouraged to facilitate this process.